

linguistic polygeneity suppose that different forms of speech grew up independently within the same race or even among the members of a fixed race. It was a question of geography not of race.

The assumption of the primitive unity of speech makes Mr. Keane an adherent of another theory which I have done my best elsewhere to combat. This is that languages develop out of an isolating into an agglutinative stage, and then into an inflectional one. I do not deny that language develops; far from it; the whole science of language is based upon such an assumption. But I can see no facts which warrant me in holding that an isolating language, for example, has ever developed except from one stage of isolation into another. In the same way the inflectional languages have developed only from one form of inflection into another; this is certainly true of the Semitic dialects, and as to the Aryan languages, Dr. Delbrück, the latest defender of Mr. Keane's theory, finds himself forced to admit at the end of a long discussion that a confident "yes" cannot be returned to the question whether the agglutination theory is verified in individual cases. It is only in the sense that the jelly-fish may be called simple that the development of language can be said to be from the simple to the complex; from one point of view, it is true, analysis and differentiation may be termed complex, but most of us would consider our modern English grammar a much simpler affair than that of Gothic or Greek. I may note here, by the way, that Mr. Keane has made a slip in saying that the final *r* of *amatur* is the reflexive pronoun *se*. *R* is also the characteristic of the passive in Old Keltic where it cannot come from an earlier *s*; it is further found in some Vedic verbal forms, and apparently in the Greek $\delta\epsilon\upsilon\text{-}\rho\text{-}\alpha$, where it occupies the same position as in the Latin *ama-r-is*.

Different views, however, as to the conclusions to be drawn from our evidence are inevitable in science, more especially in matters where certainty is unattainable. They in no way diminish the value or importance of Mr. Keane's work, which does not depend on the theories held by himself or any one else regarding the facts put forward in it. He has made "Asia" an indispensable book of reference to the geographer, the traveller, and the statistician; I will not add the politician also, as the main business of the latter nowadays seems to be to avoid acquiring accurate information. Here and there, of course, there is a misprint, as when Prof. Sachau's name is spelt *Sachan* (p. 72), or a statement to which exception may be taken. Thus I am not disposed to endorse the assertion that the Turks in Smyrna "reside chiefly in narrow, dirty slums, into which it is dangerous to penetrate alone, and which are cut off from access to the more open and safer quarters." On the contrary, in walking from the Kassaba station to the quay, when alone and at night, I have always taken good care to go through the Turkish quarter and not through the Greek. Elsewhere, however, Mr. Keane does full justice to the Turks of Anatolia, whom he describes in Dr. Scherzer's words as "honourable in all their dealings, frank, kindhearted, and hospitable, while in religious matters they are, contrary to the general impression, the most tolerant of all Oriental races."

A. H. SAYCE

MAGNETO- AND DYNAMO-ELECTRIC MACHINES

Die Magnet und dynamo-elektrischen Maschinen. Von Dr. H. Schellen. Zweite, nach dem gegenwärtigen auf der Pariser electrischen Ausstellung vertretenen Zustande dargestellte und vermehrte Auflage. (Köln, 1882.)

THIS work, which is considerably enlarged from its first appearance, now includes accounts of all the leading forms of dynamo- and magneto-electric machines with the exception of those of Edison, of which no mention is made. The first chapter is devoted to generalities concerning electromagnets, induction, &c. The second describes magneto-electric machines beginning with that of Pixii and ending with that of De Meritens. The third chapter, on dynamo-electric machines, opens with a rather unseemly revival of the dispute as to priority between Werner Siemens and Wheatstone in the discovery of the action-and-reaction principle of the so-called dynamo-machines. It is a matter of history that papers announcing this discovery were read before the Royal Society on the very same day (February 14, 1867) by Wheatstone and by Dr. C. W. Siemens. We cannot help thinking that Dr. Schellen, in his manner of describing the affair, allows himself to take an attitude extremely unjust towards the great English physicist, now no longer amongst the living; and we protest against this very needless attempt to arouse a scandal. Nor is it true that Wheatstone's memoir contained nothing that Werner Siemens had not previously published in Berlin. The proof of this matter is that Wheatstone's principle of exciting the field-magnets by a derived current in a shunt circuit was adopted as a "new method" by Messrs. Siemens Brothers within two years from the present date, and formed, in 1881, the basis of a communication by Dr. C. W. Siemens to the Royal Society, and of another by Mr. Alexander Siemens to the Society of Telegraph Engineers, in which the priority of Wheatstone in this detail is fully and explicitly admitted. In this chapter also the machines invented by Weston and by Brush are described. Chapter IV. treats of those dynamo-electric machines which generate continuous currents, beginning with Pacinotti's machine of 1863, and including the well-known forms of Gramme and Siemens (v. Hefner-Alteneck), the latter of which is described in very great detail. Hefner-Alteneck's new large dynamo with a disk-armature and many peripheral coils, is mentioned, and the general arrangement of its parts shown. The fifth chapter treats of alternate-current machines. Those of Lontin, Gramme, and Siemens are described fully, but the name of Wilde is not even mentioned! A new machine by Siemens and Halske, capable of giving either intermittent-direct or alternate currents, is figured in this chapter. This section of the book is closed by a disquisition on the theory of dynamos and their efficiency, the greater part being a compilation from the researches of Frölich, Hagenbach, and others.

Chapter VII. deals with the voltaic arc, and Chapter VIII. with electric arc lamps. A mass of details concerning the manufacture of carbon pencils and standards of photometry are included in the former. In the latter chapter most of the chief forms of lamp are given, in-

cluding those of Crompton, Bürgin, Jaspar, and Serrin. Lamps adapted for use in series or derivation, including the so-called differential lamps, are considered in a separate chapter. Amongst the forms described are those of Gramme, Weston, Brush, Hefner-Altenack (Siemens), Gülcher, and the Pilsen lamp. According to the author, the differential lamp of von Hefner-Altenack was the first to make practical the introduction into one circuit of a number of lights. Jablochhoff's well-known candle, and its more recent imitations are described briefly, and then the author passes to the semi-incandescent lamps of the Werdermann type. Edison's incandescent lamp is next described, as it was in the year 1879. All Edison's more recent improvements appear to be unknown to the author, who passes by the Edison exhibit at the Paris Exposition with a compliment upon the good quality of its colour! The incandescent lamps of Lane-Fox and of Maxim are both described and figured, whilst that of Swan—antecedent to both of the latter, as well as to Edison's carbonised filament lamp—is described only, and not figured. Details concerning driving-power, distribution, cost, and fire-risks follow. Applications of dynamo-electric machines to metallurgy, electro-chemistry and telegraphy, make a chapter in themselves, as also does the subject of the electric transmission of power. A penultimate section deals with storage batteries, in which we are glad to observe that full justice is done to Planté, the inventor of the accumulator. A rather sketchy chapter on the mathematical theory of electric arc lighting closes the work.

On the whole, though this work contains useful information on many points, it is much to be regretted that it is not so complete as might have been hoped of a book published in 1882. In a science whose applications are developing so fast, this incompleteness detracts greatly from the value of the work.

OUR BOOK SHELF

The Watchmaker's Handbook. By Claudius Saunier. English Edition, Translated, Revised, and considerably augmented by Julian Tripplin and Edward Rigg, M.A.

THERE is no trade, we suppose, in which so many special tools are used as in watchmaking, nor any in which the character of a workman is so readily distinguished by them. The good workman has good tools—a perfect army of them—nearly all self-made, with which he is prepared to execute any piece of work, in a neat, clean, and efficient manner.

This little book describes watchmakers' tools, but deals with many operations inadmissible from a manufacturer's point of view. "Every watchmaker," says the preface, "will at once recognise that receipts are included which are of the nature of makeshifts, and that it would in many cases be better to replace a piece by a new one, rather than to repair it in the manner indicated." But there is good reason for this:—"The immense number of badly-constructed watches that he (*the workman*) is called upon to put in going order for a trifling remuneration, compels him to replace the older methods of procedure by others, whenever by so doing time can be saved."

If watches were as big as steam-engines there are few people who would not be horrified at the kind of work put into some of them. But they go well? so they may (or may not), thanks to a strong mainspring, until they are pulled to pieces.

All watch repairers, or "jobbers," as they are techni-

cally called, and manufacturers too, ought, however, to be interested in this book. It contains a great deal of useful and instructive information, and it must be left to the consciences of such as to the suggestions herein contained, they would, or would not, adopt.

H. DENT GARDNER

Descriptiones Plantarum Novarum et minus Cognitarum. Fasc. viii. Auctore Dr. Regel. Pp. 150. (St. Petersburg, 1881.)

THE Director of the Imperial Botanic Garden describes a number of novelties cultivated under his own eye. One of the most striking is a new Crinum, (*C. Schmidtii*) from Port Natal, which scarcely seems separable by description from *C. latifolium*, L. The bulk of the pages, however, is filled with an enumeration of the glumaceous plants at present known from Central Asia, in the study of which Aitchison's Afghan collections have not been overlooked. 195 species of Gramineæ are enumerated, of which 79 are Asiatic, or at any rate are not known from Europe; 75 species are middle European or Mediterranean; and 37 are common to middle Europe, middle Asia, and North America.

Turning over Dr. Regel's pages affords a ready illustration of the wide diffusion of the components of the British flora. Without pretending to absolute accuracy, we noted that of the 109 species of the British gramineous flora, 65 are recorded by Dr. Regel from Central Asia. We looked with some curiosity to see if any light was thrown on the origin of our cereals. But though rye (*Secale cereale*) appears to occur in a wild state in Turkistan, the forms of wheat met with by botanical collectors were all represented by cultivated specimens. Dr. Regel does not seem to have met with, from Central Asia, *Fingerhuthia Africana*, obtained by Aitchison in his second journey; although only known to botanists from South Africa, it was found to be one of the chief fodder-grasses of the Lower Kuram Valley.

LETTERS TO THE EDITOR

- [The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]
- [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Spectrum of the Light emitted by the Glow-worm

I AM not aware that any account has been published of the nature of the light emitted by the glow-worm, and therefore venture to send the results of some observations I made on the evenings of the 21st and 22nd of the month.

The light, as is well known, proceeds from the lower surface of the penultimate and ante-penultimate segments of the lower abdomen of the insect, and also from two round spots on the last segment—it is of a greenish colour, and when examined with the spectroscope gives a short continuous spectrum extending from about C to b, and therefore containing rays of all wavelengths between 656 and 518—the more refrangible portion is far the brightest, and the general appearance is of a broad band of green light reaching from about 587 to 518, with a faint continuous spectrum extending down into the red.

I may add that the observations were made with a small direct-vision spectroscope, with a photographic scale; and also that glow-worms are extremely rare in this district.

Reading, July 29

JOHN CONROY

Oscillations of the Sea-level

It seems to be very generally assumed that the surface of the ocean attains a uniform level, or nearly so, in all lands, and forms a sort of zero-point or datum line, from which the altitude